**Scaling work stream**

**Introduction**

Increasing the impact and reach of the Africa RISING work from primarily pilot level activities reaching 100’s of farmers to a scale that reaches many 1000’s of farmers requires a paradigm shift in approaches. Implementing technological interventions to farmers at scale, referred to as scaling out, necessarily means new partnerships and approaches. For example, partnerships with development agencies or initiatives that aim to take technologies to scale, with public and private extension services and with a range of value chain actors. Scaling out also requires consideration of market demand and is an opportunity therefore to create opportunities for the private sector. Scaling up, that is influencing the enabling environment for successful adoption of the interventions, requires engagement with government and policy makers.

The appropriate models for scaling are both context specific and defined by the technologies which are to be scaled. The approaches for scaling singular component technologies (e.g. improved germplasm) as compared with knowledge intensive models where the integration of components or farming system changes are promoted, are necessarily different. With Africa RISING largely focused on the concepts of SI, which is a set of processes or a combination of technologies that lead to overall system benefits, scaling knowledge intensive technological changes is therefore the main challenge. This also presents the team with a great opportunity for science to inform this design for better outcomes.

Fundamental to scaling are:

1. Social engineering and exposure of the community to new practices and market opportunities.
2. Demonstrations and action research to contextualize the interventions
3. Local champions or lead farmers
4. Consideration of the market opportunities for produce and input requirements
5. Building capacity in the NARES and public/private sector partners.
6. The role of the private sector

In pilot scale projects such as in phase I, components 1-3 have become important. Summary for this scaling work stream is indicated in Annex 1.

**Selecting technologies for scaling**

The broad terms guiding generation and selection of technologies for taking to scale are presented in the Africa RISING Program Framework which states, as one of its outputs, that it will generate integrated technology combinations that are effectively targeted to farmer’s real development needs. The technologies or technology components aim at productivity enhancement, natural resource management, income generation, knowledge management and most likely a combination of these; and they should also relate to social and institutional arrangements. No specific practical guidelines were developed to identify scalable innovations; however, researchers have over the last four years, defined the technologies developed to be best-bets when they have contributed positively to the physical (e.g. increase in yield), economic, nutritional and environmental attributes. Scientific rigor has been defined by the tests a technology has gone through on a number of mother and baby sites in defined agroecologies, and observations on interested beneficiary groups. These definitions will continue to be used in the development of technologies for scaling and will be complimented by more defined SI indicators now undergoing development.

**Scaling pathways**

Scaling-up successful development interventions is critical if SSA is to achieve the MDGs and make essential gains in agricultural productivity, rural incomes, and food and nutrition security. The scaling-up of new technologies, practices, or innovations is designed to stimulate wider scale change not only to the target farming households and their communities but also in government policy, operational modalities, and institutional set-up and structure. Scaling-up is not an end in itself, but an instrument to achieve the goal of improved livelihoods for the greatest number of people and reaching wide geographical settings. Two types of scaling approaches could be adopted. Horizontal scaling, also known as scaling-out, deals with reaching more people and wider areas both in the areas of the previous project and newly targeted districts. This includes farmer-to-farmer and community-to-community exchange of technologies, with or without the engagement of external actors. Vertical scaling, also known as scaling-up, refers to the hierarchical institutional integration and partnership, which is fostered to reach large numbers of people and geographical areas. For successful scaling-up, best practices and innovations that are proven in the local context are essential. Though the program in the different countries is at various stages, Africa RISING has been experimenting on scaling-out technologies and practices that could be promoted to scale-up to influence policy and national planning.

**Scaling approaches**

Identifying successful approaches to scaling innovation in an R4D project is highly dependent on a number of factors related to the new technologies (crop varieties vs complex NRM and livestock related technologies) and management practices themselves, the nature of the farming systems practiced, social and cultural factors and the wider enabling environment (markets, other institutions and policies). Ideally scaling activities are tightly embedded in projects and emerge with close links other activities and with the close involvement of partners. There are no recipes for successful scaling. However, in the context of the Africa RISING projects, we believe that we have been able to identify some useful principles and practices that are likely to contribute, either individually or more likely in combination, to effective scaling of the projects’ more promising innovations. Field days, expert training, farmer to farmer knowledge exchange, establishing and strengthening local institutions, mobilizing development partners, introduction of service provider models, engagement through innovation platforms and exchange of seed and other planting materials can be some of the approaches to be used for scaling technologies and practices. One of the strengths of Africa RISING has been the committed involvement of our local development partners from an early stage of the project. To date, these partners have enriched our research planning with a development perspective. As we strengthen our scaling activities, their role will be critical in achieving adoption by more farmers than research projects would generally expect to address. We should continue to look for private sector and NGO engagements. This is where our innovation platforms can be hugely effective. Examples of scaling approaches for crop and livestock technologies are indicated in Annexes 2,3 and 4.

**Enabling environment- targets (partners and beneficiaries), markets, capacity building, domains, scenarios, gender**

Successful scaling of SI options requires enabling bio-physical (climate, soil, rainfall, temperature, etc.) and socio-economic (policies, institutions, markets, gender, etc.) environment. Multi-stakeholder public-private sector partnerships involving community-based organizations, researchers, market actors, policy makers and development agents will be established to create an enabling environment for vertical and horizontal scaling of technologies/practices. Joint activities will be undertaken with appropriate partners to: share information, identify scalable SI options, develop scaling scenarios and target scalable options using Geographic Information Systems and Remote Sensing and modelling tools to reach out to a large number of beneficiaries (Annex 5). Scaling and delivery options used in past projects will be reviewed to identify appropriate pathways to enhance information flows among farmers, men and women, and among communities. The effect of national and local policy and institutional arrangements, social norms and rules, gender and markets on reaching out to beneficiaries and adoption of SI options/practices will be evaluated. Community discussions, field schools, technology parks, farmer-to-farmer joint learning and exchange visits will be used to build capacity of farmers to facilitate reaching out to a large number of beneficiaries and adoption of technologies on a large scale.

**Research on scaling**

Functional scaling-up strategy that could be used by wider actors identified, developed and promoted along with incentives for wider impact

* + 1. Identifying policy gaps and barriers (e.g. institutional support, market access, input availability, credit) in various Africa RISING program countries and capacity requirements required for scaling-out, Scaling up; strategies for better positioning smallholder producers in the supply/market chain;
    2. Identifying push and pull factors driving scaling out and scaling up agricultural innovations in the various Africa RISING target countries;
    3. Developing strategies for joint action and influence by creating strong partnership between various actors (Policy makers, development partners, input suppliers, processing and export companies; Ministry of Agriculture, Farmers’ Training Centres, and other major actors in the country); Organizing various scaling-out forums for joint strategy development, policy dialogue and debate between various actors that would facilitate scaling-out of integrated innovations, knowledge sharing and informed policy decisions;
    4. Identifying and testing best-fitting scaling-up approaches across the value chain and various social groups, population, and administrative settings (mini-package approaches, Demonstration fields, local government cells, private sector, NGOs compared to conventional pathways for reaching wider communities with integrated innovations);
    5. Identify the most appropriate communication strategies for scaling-up and scaling-out of integrated innovations

Outputs from research on scaling include:

* Key policy incentives and capacity development required for scaling out integrated agricultural practices identified, published and shared with policy makers
* A functional platform that would include regional actors, consisting of major actors at various levels, that would be set to facilitate change in the region established and made operational.
* A scaling-out strategy guide, with communication tools and methods that will assist planning and inform decision making, produced and shared
* Various forums for policy dialogue and debate between communities, researchers and policy makers that would facilitate knowledge sharing and informed policy decisions organized and facilitated.

**Annexes**

**Annex 1. Summary of scaling work steam**

In order to achieve scaling for impact, there are key pre-requisites that need to be put into consideration. Some of these pre-requisites could vary depending on the context. The pre-requisites include an enabling environment, targeting suitable agro-ecologies and using appropriate ‘vehicles’ or channels for scaling. Potential complementarities include identifying strategic implementing partners that have the ability to take this work to scale as well as the private sector and development community. The key here is to consider the sustainability of scaling by getting partner buy-in form existent institutions or structures  e.g. agro-input dealers, millers and ICT platforms such mobile cellular hubs. It is envisioned that none of the aforementioned factors would play in isolation but would be simultaneously rolled out with others in an enabling environment.

**Scaling for Impact**

**Enabling Environment:**

Institutions, Markets, Policies

**Vehicles for Scaling**:

Agro-dealers, Millers,

Leaf Farmers

Geo-Tools for Domains analysis

Out-scaling

Potential

**Agro-Ecology and Crop Suitability**

Soils, Climate, Altitude,

Varieties, Rainfall

Implementing

Partners

Private Sector,

Development

Community e.g. NGOs

Buy-in:

Identify target

farmers

Develop

Implementation

Mechanisms or Scaling Pathways

Buy-in:

Identify target

farmers

**Annex 2. Scaling approach: An example from Tanzania**

Scaling of agronomy technologies in Tanzania have been based mainly on two drivers; the first is the researcher-driven process that allows expansion within a geographical area (research sites) designed primarily as a means of scientific replication tests (participatory on-farm approaches) and pilot scaling of technologies. By its nature, scaling is limited to few clients. The second driver has been a partnership between researchers (Africa RISING) and a development institution (NAFAKA) that is targeting expansion both within the research sites and to areas beyond the research sites, with a consequent increase in the number of clients.

As a development institution, NAFAKA seeks to increase productivity and competitiveness of selected cereals whose success requires availability of informed yield enhancing innovations for scaling-up and -out in the target regions of Tanzania whose coverage is beyond Africa RISING research sites. Africa RISING generates these innovations as its outputs, combines them into information and technology packages, field test them through a network of NAFAKA grassroots organizations (Figure 1- A), and back-stops mainstreaming into the wider NAFAKA rural development programs (Figure 1-B&C), reaching more than 45000 (Figure 1-C) household in 3 years. Monitoring of this process provides Africa RISING with opportunities to study the essential ingredients of successful scaling. The field testing stage is mainly in new expansion areas; it is intended to provide opportunity to fine-tune approaches into best fits, but most importantly provides a medium for building capacity of the development partners’ personnel.



**Annex 3. Scaling approach: An example from Ethiopia**

Crop residue is a major feed source for livestock in the Ethiopian highlands. However, there is high wastage of this resources due to poor storage facilities and feeding practices. Africa RISING project introduced research interventions on crop residue management in its four research sites. Improved crop residue storage facilities and feedthroughs are some of the interventions demonstrated to some farmers. We also involved local partners such as extension from the beginning in the research planning, field demonstration, field days, visits and trainings to speed up adoption of the feed related and other technologies. In Endamehoni Africa RISING site, government extension staff members participated in planning and implementation of program activities. As a result, they are now trying to scale up feed-trough technologies to five *kebeles* administrations (each comprising 800–1,800 households): Africa RISING is closely working with partners not only at local level but also at regional level. The Tigray Regional Agricultural Bureau uses the Endamehoni Africa RISING site as a benchmark site for different crop and livestock technologies.

**Annex 4. Scaling approach: An example on post- harvest treatment in Tanzania**

Diagnosis of postharvest handling constraints and the causes of postharvest loss of food in Babati; **2012/2013**

Participatory field testing of improved processing technologies and postharvest loss prevention technologies; **2013/2014**

Pilot-testing of processing/storage technologies at commercial level, farmers’ training & technology dissemination; **2014/2015** & **2015/2016**

**Future or new locations:**

Dissemination and economic viability assessment of postharvest management technologies; **2015/ 2016**

**Africa RISING Postharvest/processing research activities**

**Time**

Characteristics of each stage of scaling

**Commercial phase**

1. Commercially viable, environmentally friendly & culturally acceptable technologies; possibly with location specific adaptations
2. Several Villages or communities
3. Large population of farmers
4. Technology with higher scale/capacity
5. Commercially oriented farmers
6. Researcher – Assessing/documtg lessons
7. Support-Extension/development partner
8. Private sector promoter – nurture for profit

**Experimentation by farmers (piloting)**

1. Best-bet/technically efficient/feasible technologies;
2. Exprmtn by lead farmers
3. Village/community level
4. More locations
5. Researcher - nurture technologies
6. Extension/development partners

**Research/Field testing & technlg selection**

1. Likely adopters
2. Household level
3. Few locations
4. Researcher - test technologies
5. Many technologies

Research/scaling phases/ stages

Capacity of technology/product output per unit time

# of farmers/ locations involved

Technology 1

Technology 4

Technology 1

Technology 2

Technology 4

Location X

Location 1

Technology 1

Location X +1

Location X

Location 1

Technology 2

Technology 4

**Scoping**

1. Understanding Postharvest (PH) constraints & the consequences on FS & income
2. Selecting priority PH technologies

Technology 1

Technology 4

Technology 1

Technology 3

Technology 1

Technology 2

Technology 2

Technology 2

Technology 4

Technology 5

Time

**Annex 5. Simulation scenarios for scaling-up in AR**

Modeling will be one of the main components of the scaling strategies in Africa RISING. It can be considered as an aid to M&E and learning. Simulation models have proved to be useful in capturing the interactions between climatic conditions, soil types and nutrient dynamics in cereal-based farming systems in Africa. Modeling approaches can be used to assess the contribution of agricultural research to overall output growth at the whole farm/household level and to ecosystem stability at the landscape/community level. Combined with relevant participatory approaches, modeling approaches can be used to assess the adoption/dissemination of specific interventions by targeted communities in research sites and when they are scaled-up and -out. M&E methods include econometric models that rigorously link R&D and/or R4D to productivity growth and other project outcomes. The models also include computable equilibrium models that capture multiplier effects and broader economic linkages (for example, among different labor markets). These more systemic approaches can also provide an evaluation framework for agricultural innovation systems.

The choice of the farm household scale helps focus research activities on understanding household needs and incentives to supportive effective evaluation, adoption and adaptation of the most relevant interventions. The complexity of the farming systems necessitates that these interventions are identified and insights are provided on better targeting into local farming systems. Farming system modeling has become an accessible tool for developing intervention strategies targeted at smallholder farms. Farm-scale analytical tools that can adequately model the dynamics and key interactions of a real farm will be used to analyze and address the complexity as well as to simulate the productivity of highly-constrained smallholder farming systems. Bio-economic simulation models are proposed in an integrating platform for assessing changes in system productivity at farm-scale across the three projects. Findings will be used to make projections of indicators and outcome and impact indicators at scale, building on the monitoring data to be collected.

The proposed approaches are: NUANCES (Nutrient Use in Animal and Cropping Systems: Efficiencies and Scales), APSIM (Agricultural Production Systems SIMulator), APSFarm (Agricultural Production System, an extended configuration of the APSIM), and DSSAT (Decision Support System for Agrotechnology Transfer). These approaches will be used to:

* Analyze and address the complexity;
* Model key dynamics and interactions;
* Simulate the productivity of highly-constrained farming systems.

**Crop modeling** Crop modeling platforms can effectively integrate agro-ecological, agronomic, and farmers’ behavioral information and produce data to simulate what if scenarios on various changes on the crop productivity and its consequential environmental impacts, as well as to effectively generate counterfactuals of non-adoptions. These models can first provide estimates of potential crop productivity changes under the scenarios of farmers’ adoption of improved technologies, and then they can use the estimates as input to the economic modeling frameworks at multiple levels.

They will support two levels of analysis: site-level and the Zone of Influence (ZOI)-level. First, for each AR site, a detailed, calibrated modeling framework will be developed using available in-situ measured agro-ecological data, agronomic data, analysis on the AR baseline survey data, and iterative reviews from AR partners. Secondly, the site-level modeling framework will be implemented in a grid-based modeling framework at the proposed spatial resolution of 1 km and extrapolated across the Feed the Future Zone of Influence in each country. This will utilized existing soil property data, agro-climatic data, socio-economic data from nationally-representative household survey and agricultural census data, and other market-level spatially-explicit data to support the scaling-up analysis from the AR site to across ZOI. Using the appropriate parameterization of modeling framework, AR’s focus SI technologies and management practices, such as the treatments defined in ongoing mother-baby trials, will be implemented in the modeling framework.

**Integrated modeling framework development**. Indicators for different strategic farming systems options will be calculated, based on the cropping systems results, livestock models, and household survey data. Indicators will initially include full economic profit (and its variability), biomass, protein production diversity, soil carbon content, nitrogen leached, and crop water and nitrogen use. Simulating our cropping systems models over multiple seasons and multiple locations will then provide us with temporal and spatial insights into farming systems innovations.

The novelty will lie in using cropping-systems outputs in bio-economic analysis. These outputs could either be model-based outputs or agronomic measurements from surveys or field experiments. Trade-offs, constraints, and opportunities associated with possible innovations (like legumes and perennials) at the household level will be addressed. Our angle would be to complement the biophysical analyses with profit, economic risk, labour use, production diversity, and other household-level dimensions.